PROCESSING OF DDGS INTO LIVESTOCK FEEDS

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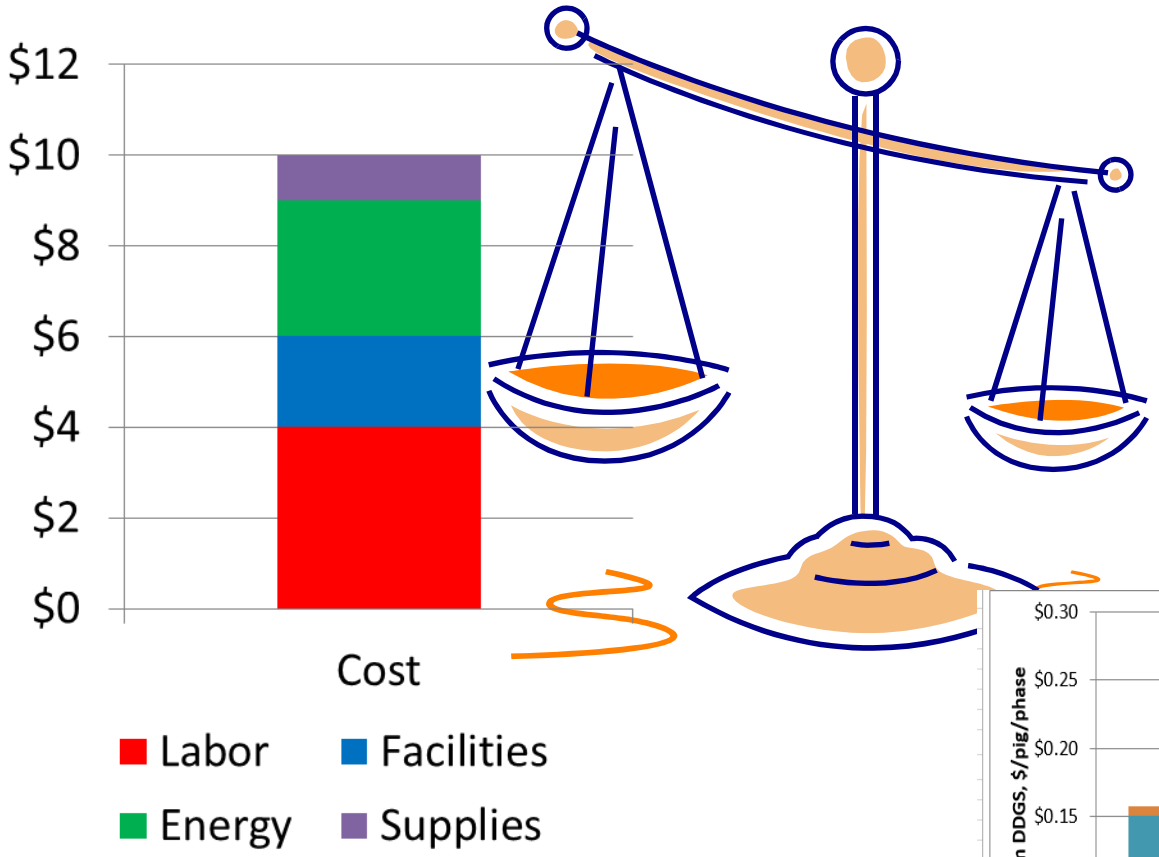
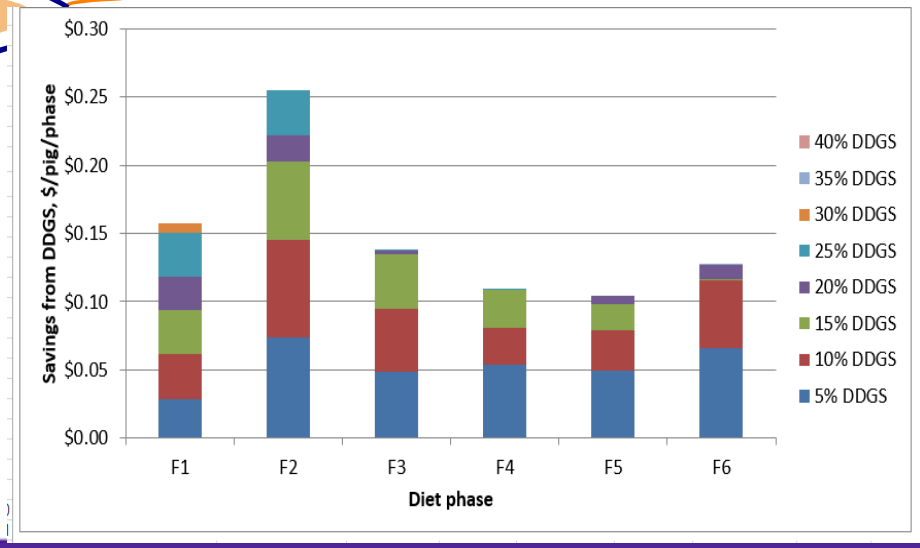
Manufacturing Cost vs. Least Cost Formulation



DDGS Formula Savings



10% Savings = $1.00

DDGs Process Variation

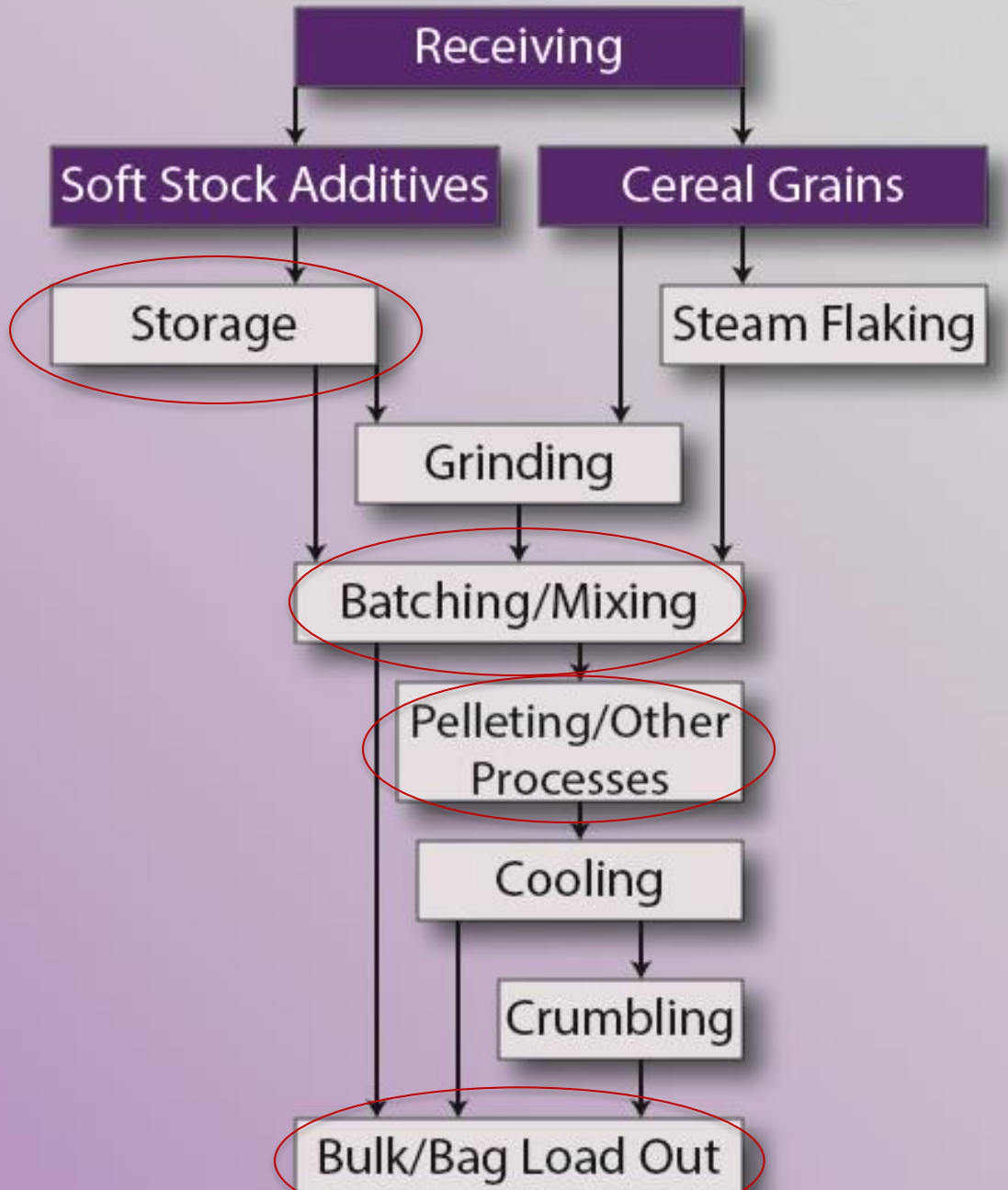
- Plant design
  - Proprietary processes
  - Commodity DDGS
  - Low fat DDGS
- Processing parameters
  - Production rate
  - Drying capacity
  - Weather (humidity, temperature)
  - Storage capacity

DDGs Variability

	Plant 1	Plant 2	Plant 3
Protein (%)	8.0	8.3	9.3
Protein (%)	26.0	29.9	29.0
Fiber (%)	15.0	7.9	6.2
Ash (%)	5.5	4.4	4.2
Bulk Density (lb/ft^3)	33.8 – 35.6	29.0 – 29.3	27.4 – 27.8
Packed Bulk Density(lb/ft^3)	38.8 – 40.5	32.7 – 33.8	29.7 – 31.1
Angle of Repose	40.5 – 45.5	39.5 – 43.5	40.0 – 43.0

Adapted Rosentrater, 2012

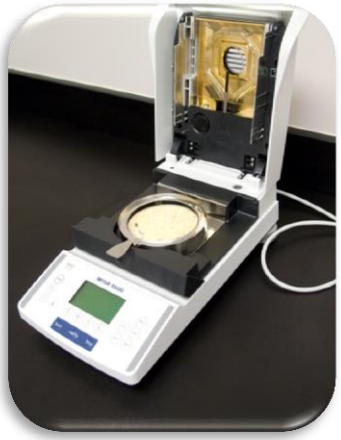
Feed Manufacturing Flow



Receiving Process

Sampling

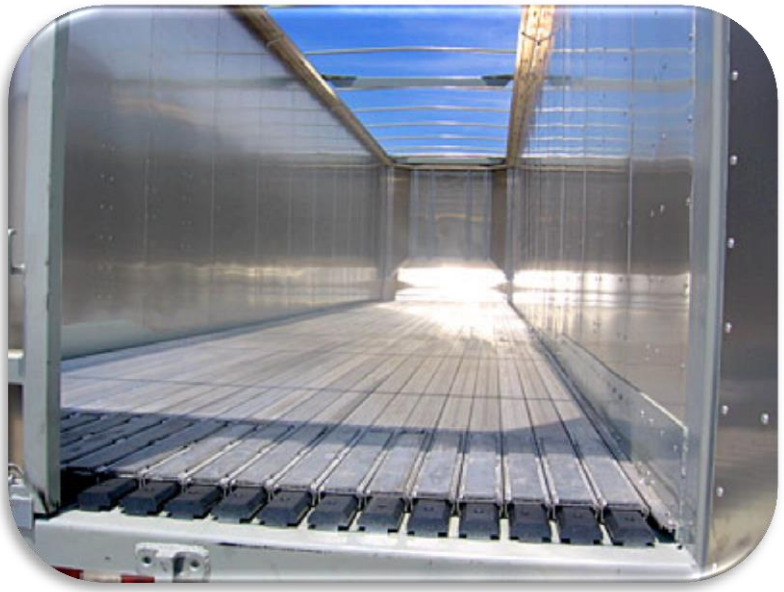
Truck Receiving Pit



QC Checks

Rail Receiving Pit

Truck Receiving



http://www.bulkequipment.com/

http://www.haletrailer.com/

DDGS Railcar Shipments

- Unloading rail cars requires greater effort requires:
  - Time
  - Employees
  - Equipment

Unloading Solutions

http://www.brandt.ca/

http://pneumat.com/hopperpopper/

Feed Mill Storage

Feed Mill Flat Bottom Storage

Flat Bottom Storage

Floor Drags & Front End Loaders

Bin Allocation Above Batching Scale

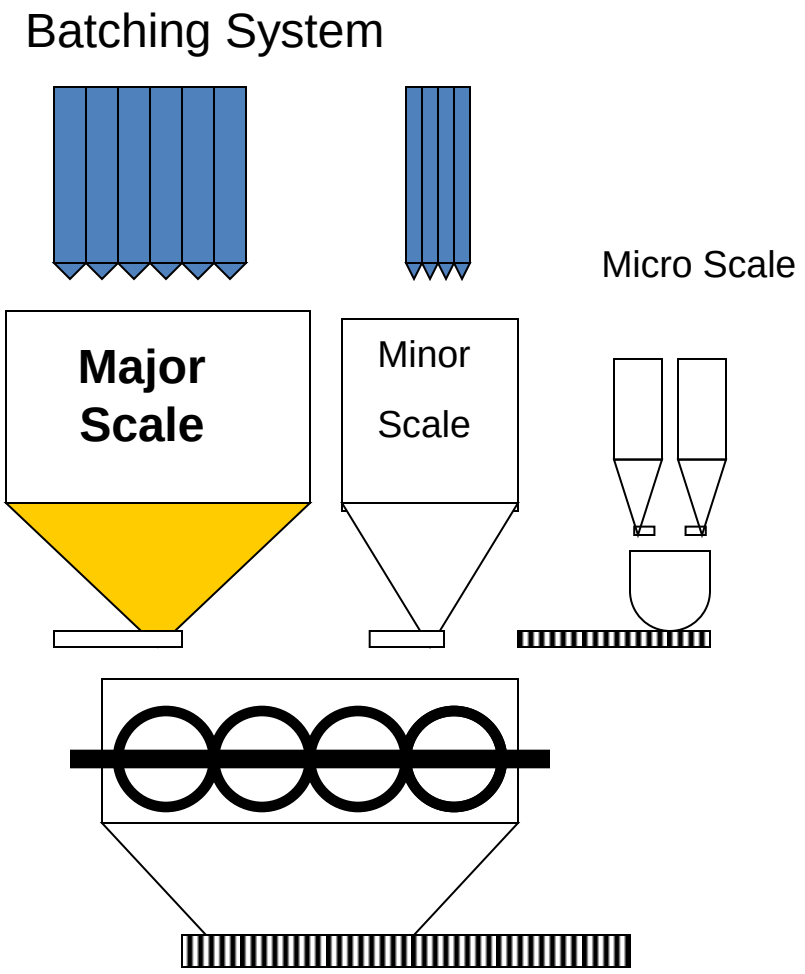
Ground Corn	Ground Corn	Ground Corn	Coarse Corn	Limestone
Wheat Midds	Wheat Midds	DDGS	DDGS	Salt
SBM	SBM	DDGS	Spare	Phosphate
SBM	SBM	DDGS	Spare	Lysine

Swine Finisher Diet

	Corn-Soy-30% DDGS		Corn-Soy	
	lbs/ton	lbs/batch	lbs/ton	lbs/batch
Corn	1,325	10,600	1,693	13,544
SBM	26	208	261	2,088
DDGS	600	4,800		
Daily Use	300 T (12 trucks)			

Assume 1000 ton/day of complete feed

Batching Process



Major Scale:

Computer draws multiple bins to the major scale.

Computer switches to one bin and jogs at the end of the each ingredient.

Major Ingredients

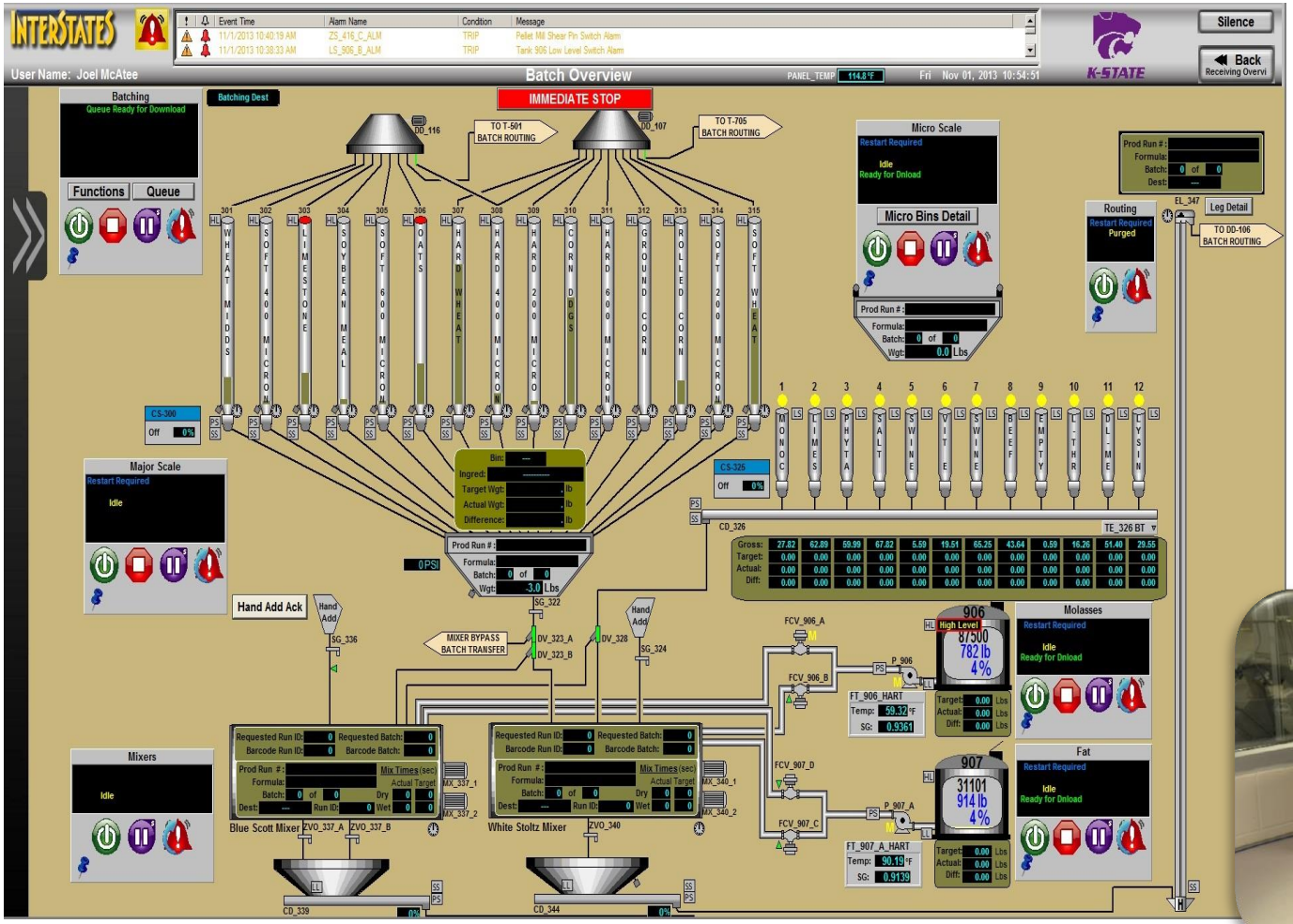
Corn

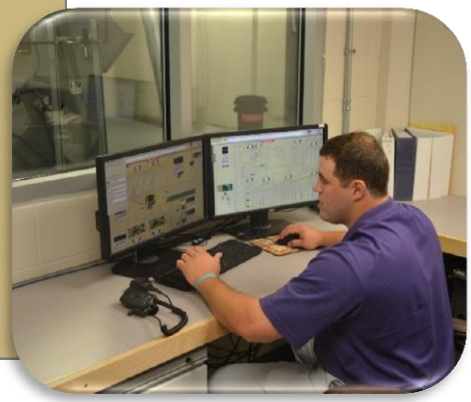
SBM

Midds

DDGS

Automation Control System





Screw Conveyors and Scale

Screw Conveyors

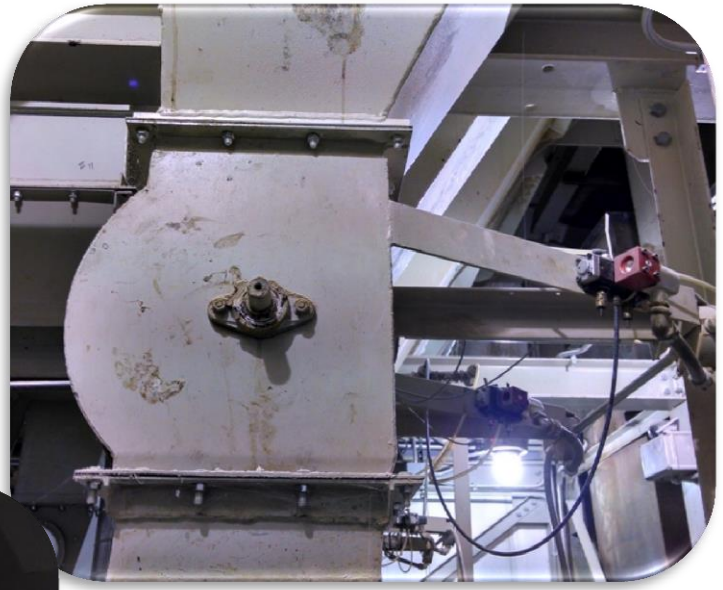
Long Hopper Transition

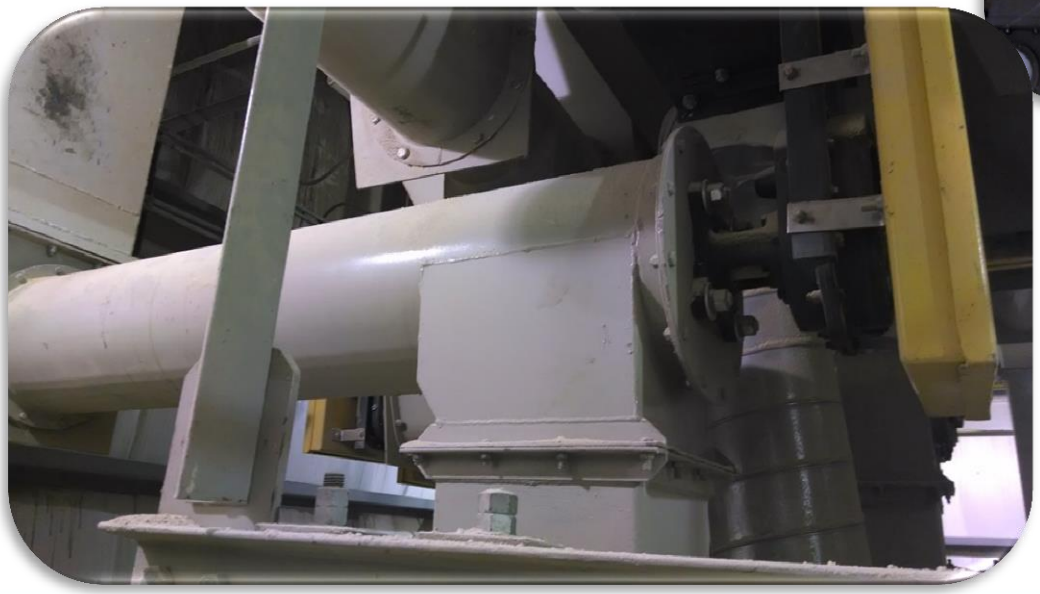
Multiple Screw Conveyors

Single Screw Conveyors

Screw Conveyor and Air Gate

Screw conveyors transfer ingredients from the bins to the scale.



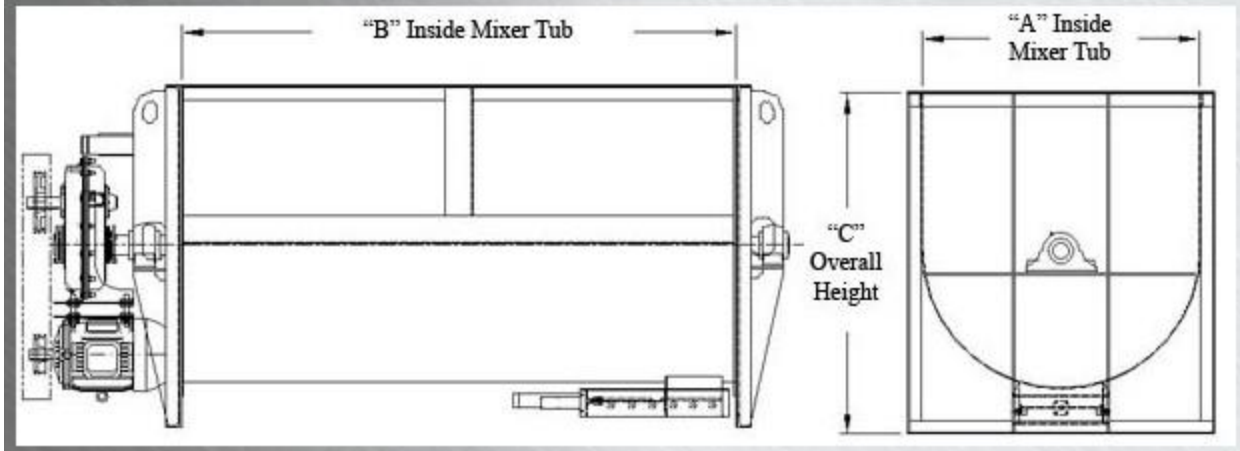


Air gates open and close to add material to the scale.

Ingredient Batching Scales

Mixer Sizes

Hayes & Stolz Single Shaft Carbon Steel Mixers

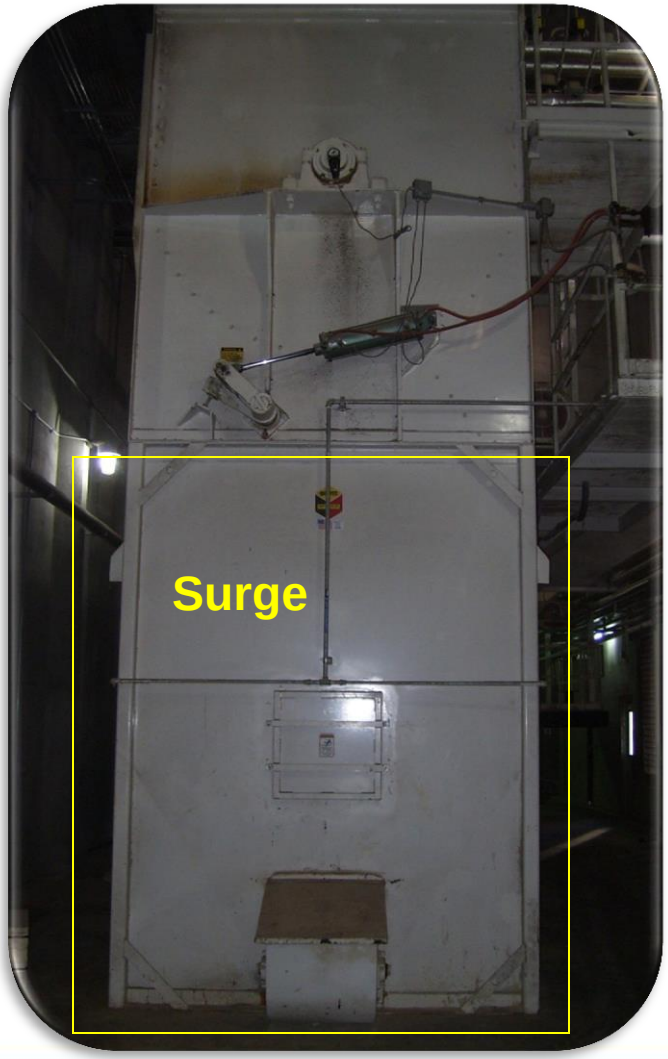


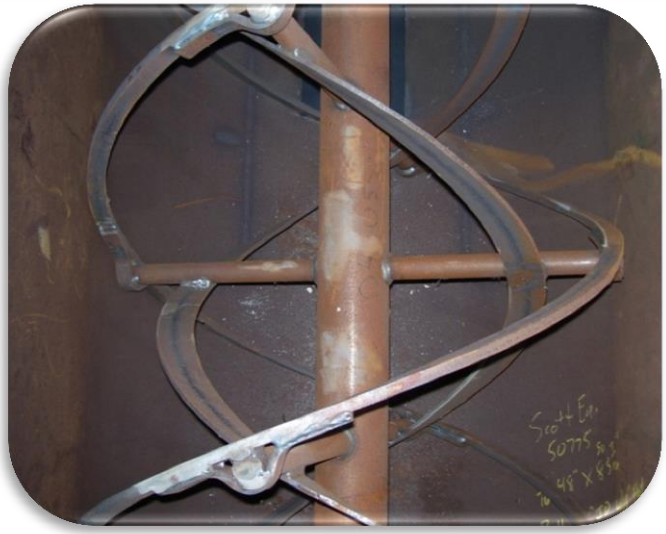
CAPACITY	DIMENSIONS			
	A	B	C-Ribbon	C-Paddle
10 CF	22	44	34 1/2	34 1/2
15 CF	26	50	38 1/2	38 1/2
30 CF	32	64	44 1/2	44 1/2
42 CF	36	72	48 1/2	48 1/2
58 CF	40	80	54	61
86 CF	46	92	60	67
114 CF	50	100	64	71
128 CF	52	104	66	73
196 CF	60	120	74	81

200 CF Mixer

Feed (lbs/cft)
- 35 - 7000 lbs
- 40 – 8000 lbs
- 45 – 9000 lbs

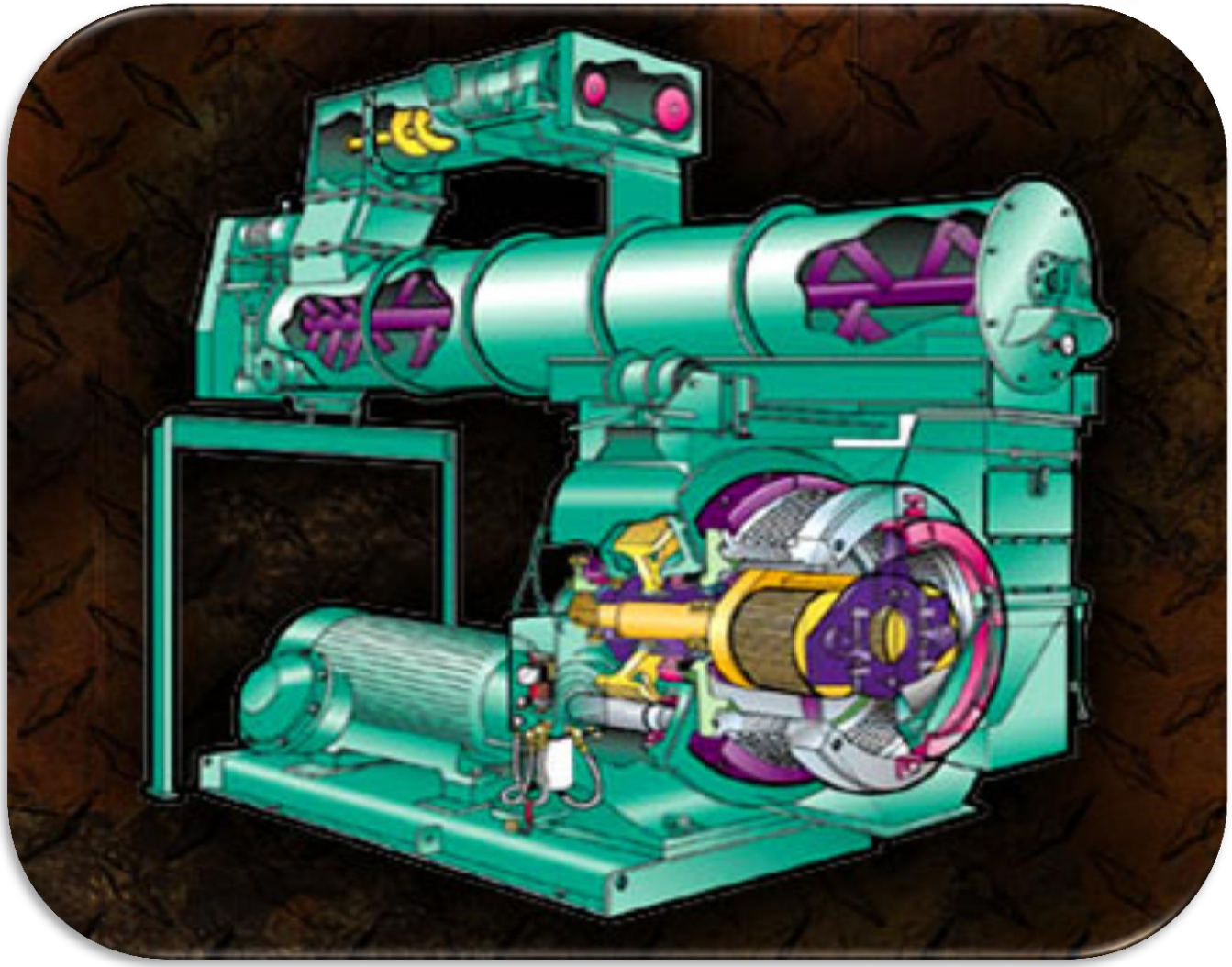
Horizontal Ribbon Mixer





Ribbon Mixer - Counterpoise

Pellet Mill

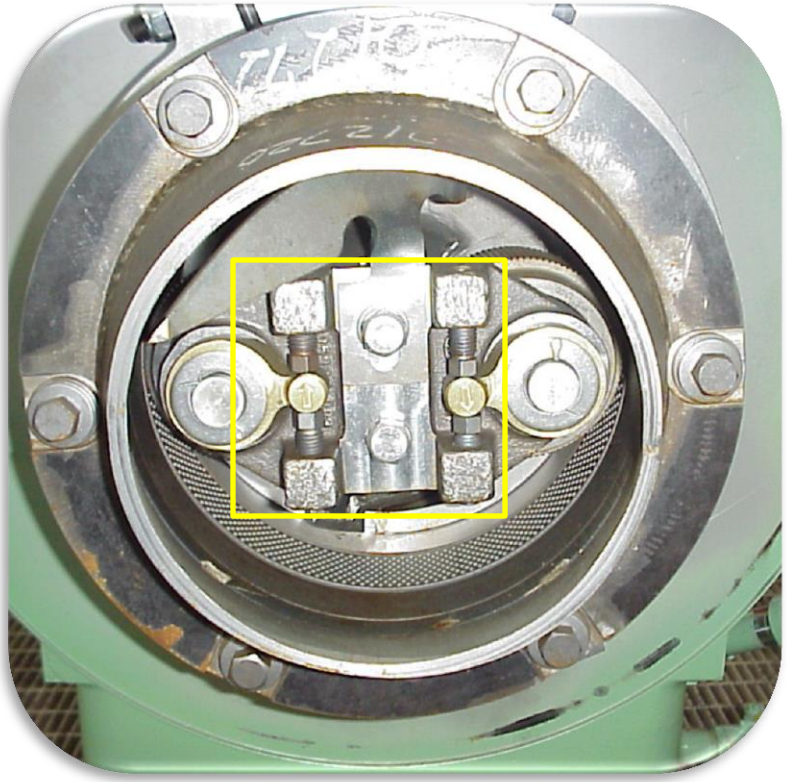


http://www.cpmroskamp.com/pelletmill/products/pelletmills/

Extended Conditioning

CPM Hygieniser

Pellet Mill Die & Rolls



Effect of Die Size and Material Hole Count

11/32 Vs 12/32 Hole Counts

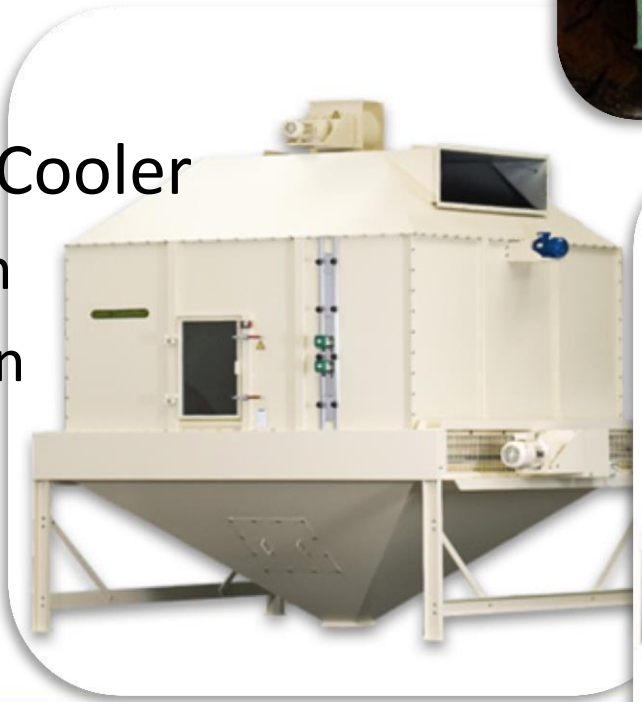
- 7932-11
- 4.5mm CP x 3.25" x 1.75" SPSTGSTPVR C+
- Total Holes = 16,896
- 4.5mm CP x 3.25" x 1.50" SPSTGSTPVR Blue
- Total Holes = 18,304
- 4.5mm CP x 3.25" x 1.563" SPSTGSTPVR C+
- Total Holes = 17,280

- 7932-12
- 4.5mm CP x 3.25" x 1.75" SPSTGSTPVR C+
- Total Holes = 19,584
- 4.5mm CP x 3.25" x 1.50" SPSTGSTPVR Blue
- Total Holes = 21,216
- 4.5mm CP x 3.25" x 1.563" SPSTGSTPVR C+
- Total Holes = 19,968

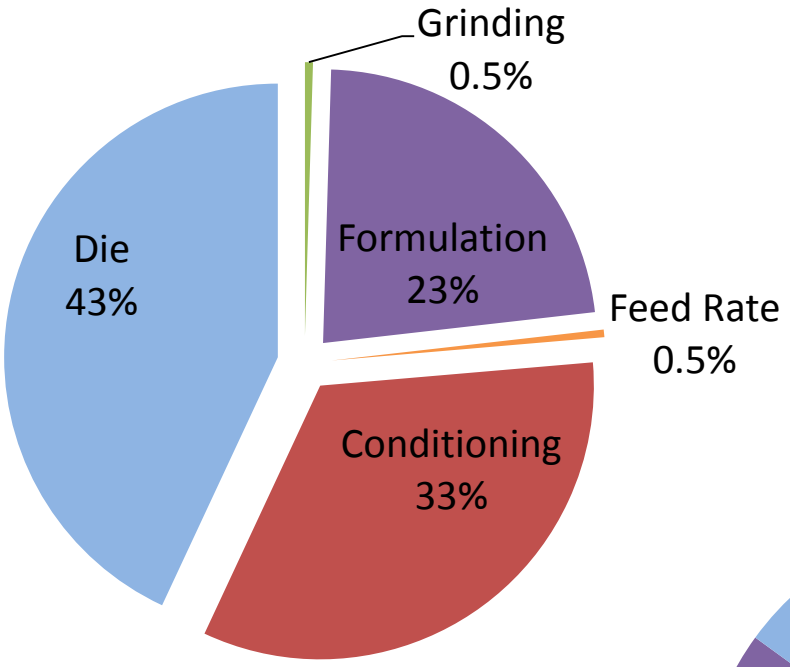
Shockley, 2013

Pellet Coolers

- Types
  - Horizontal Coolers
    - Single Pass
    - Double Pass
  - Counter-flow Cooler
    - Round design
    - Square design

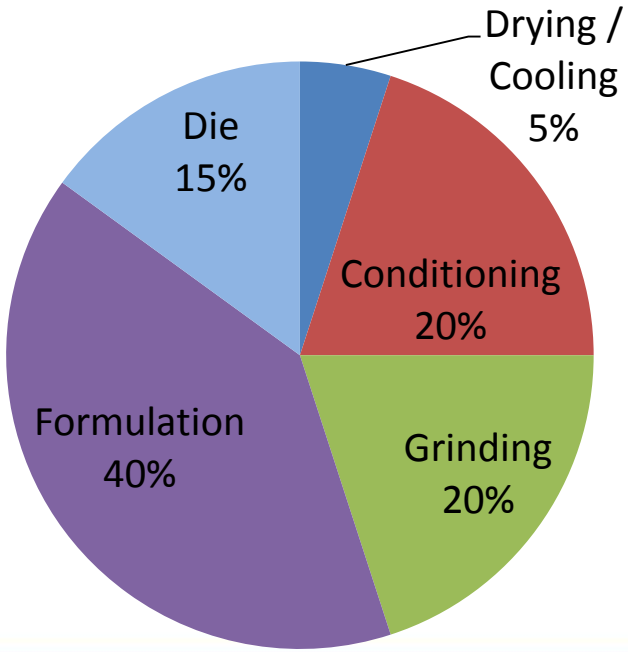


Factors that Affect Pellet Quality

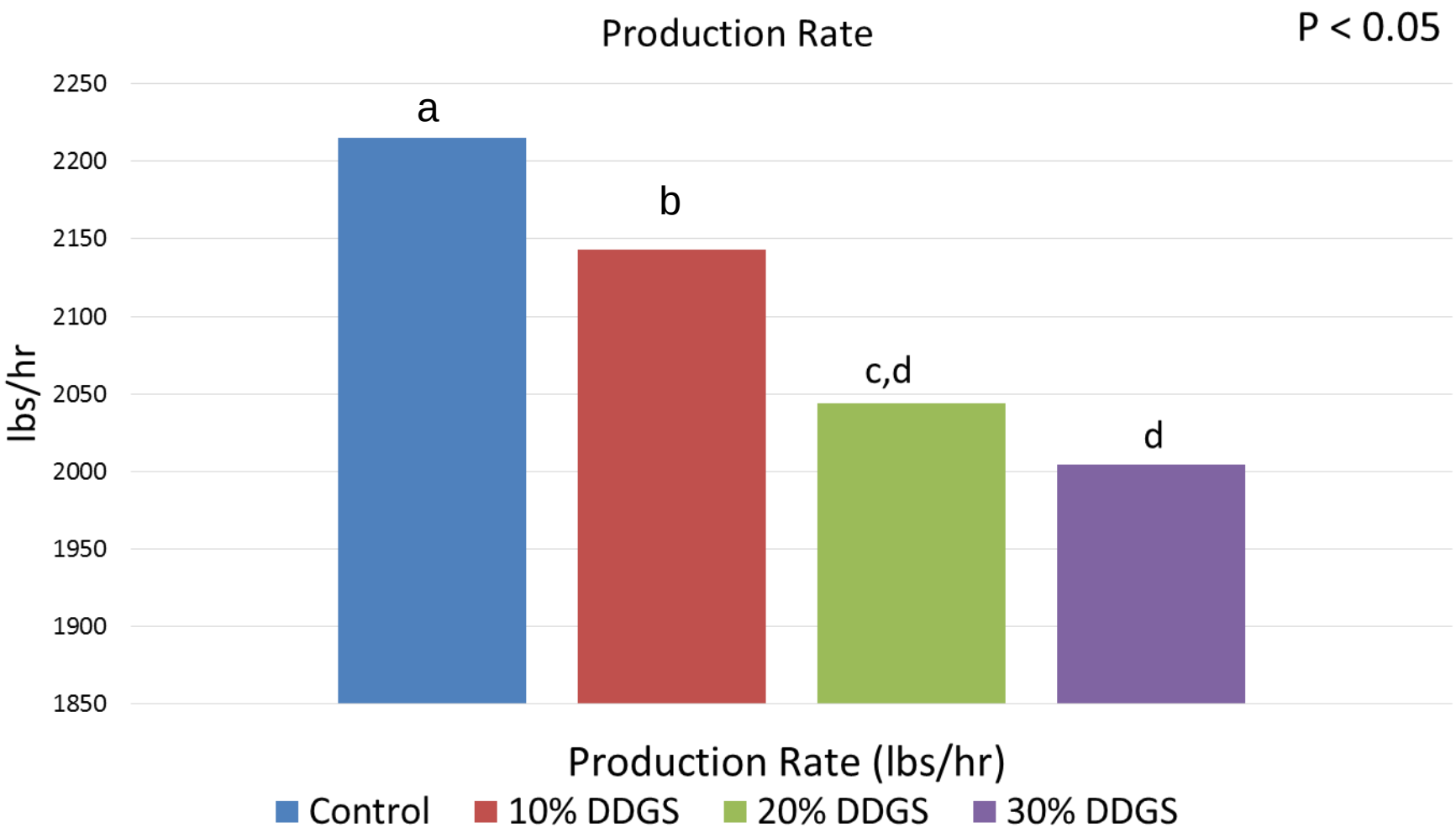


Fahrenholz, 2012

Behnke, 1994

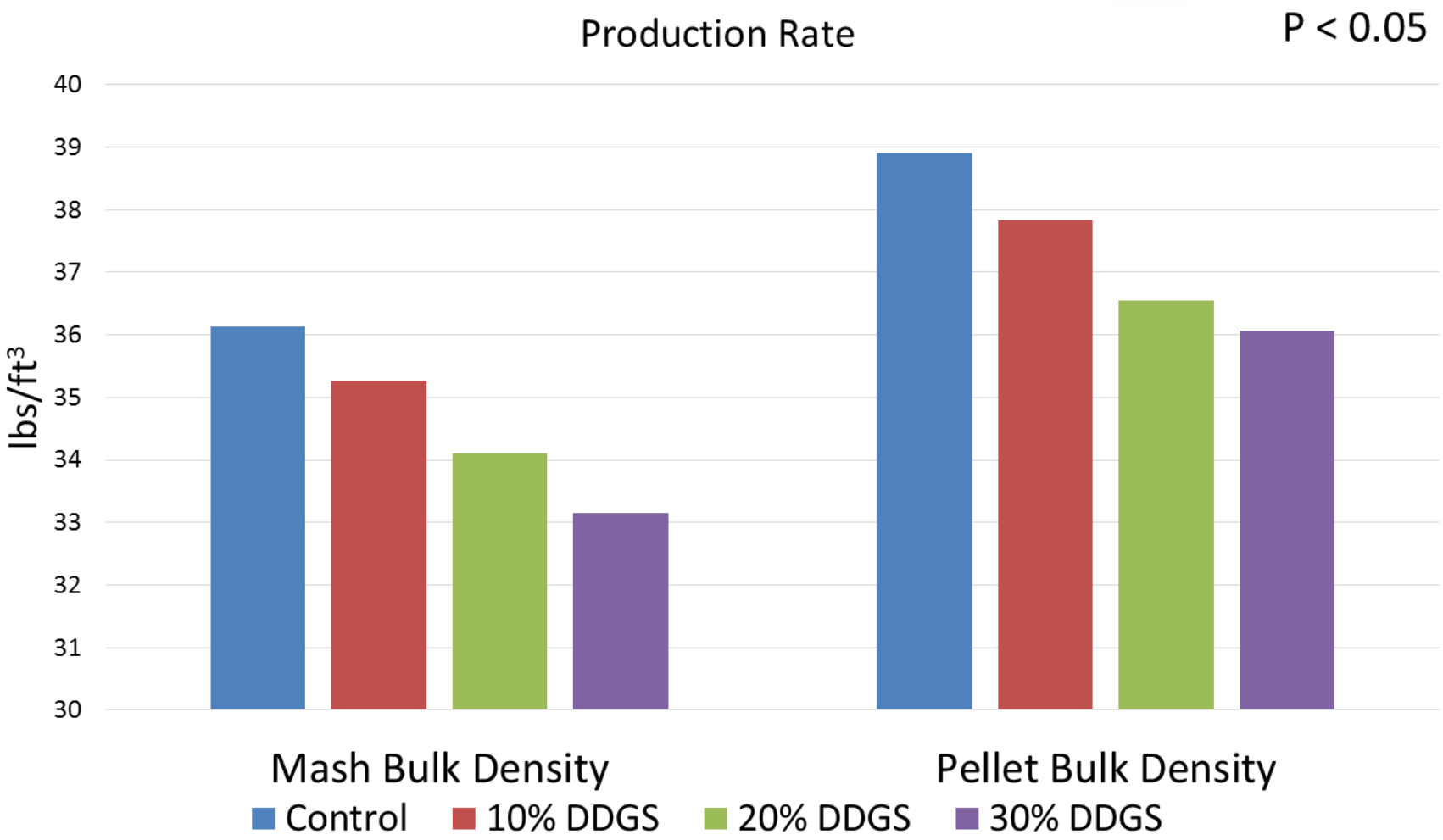


Effect of DDGs on Pelleting



Fahrenholz, 2013

Effect of DDGs on Density



Fahrenholz, 2013

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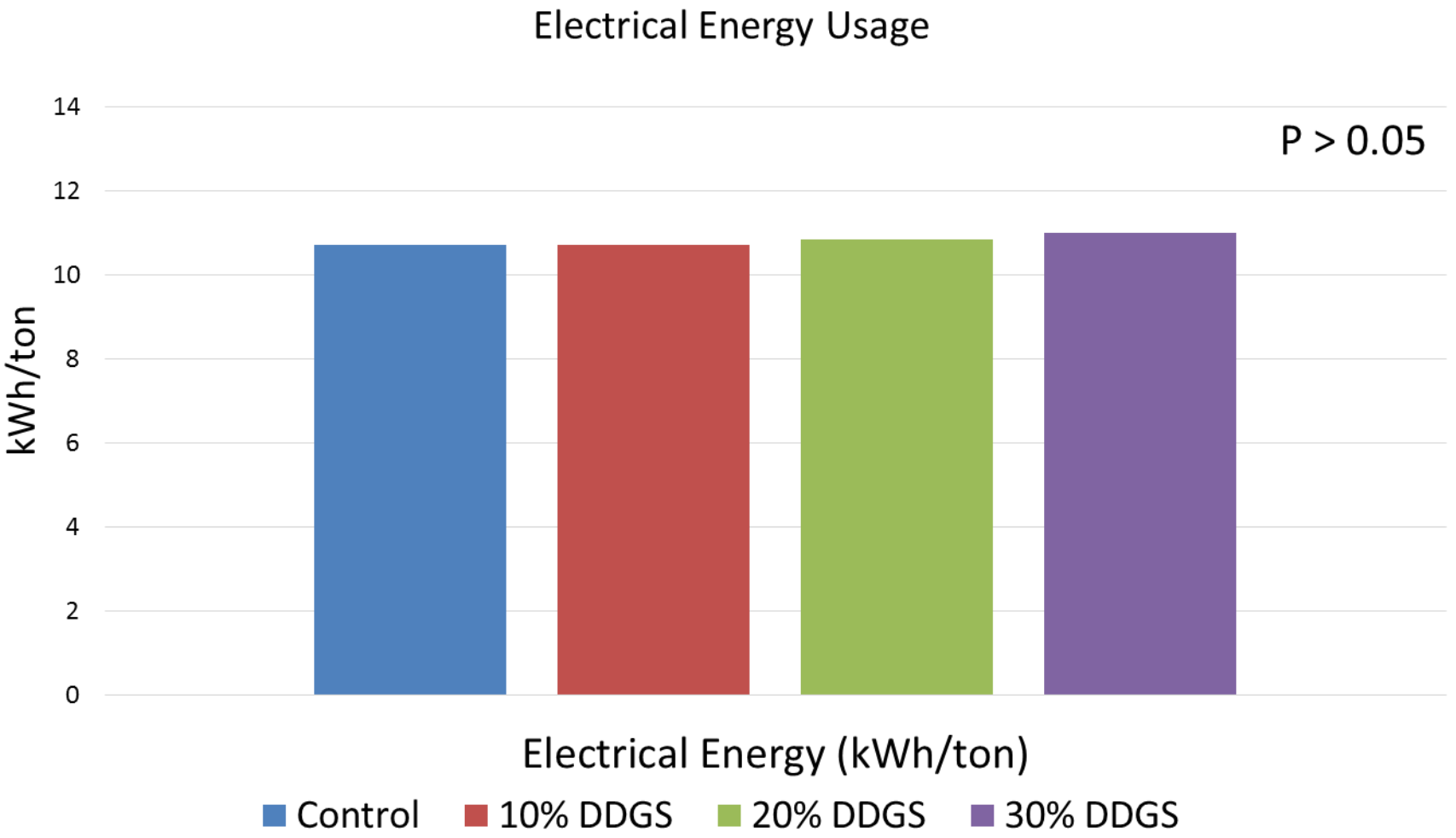
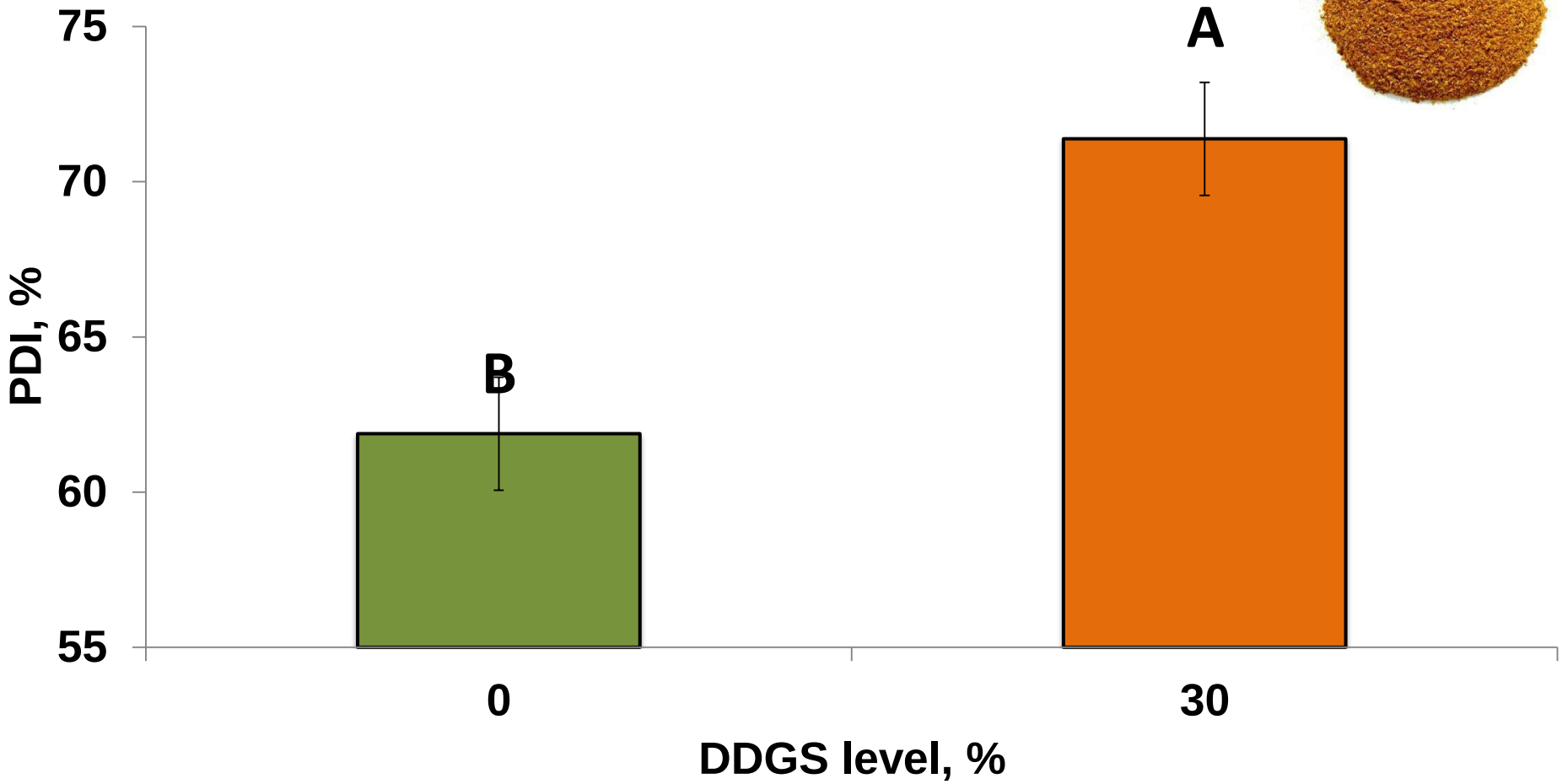


Fahrenholz, 2013

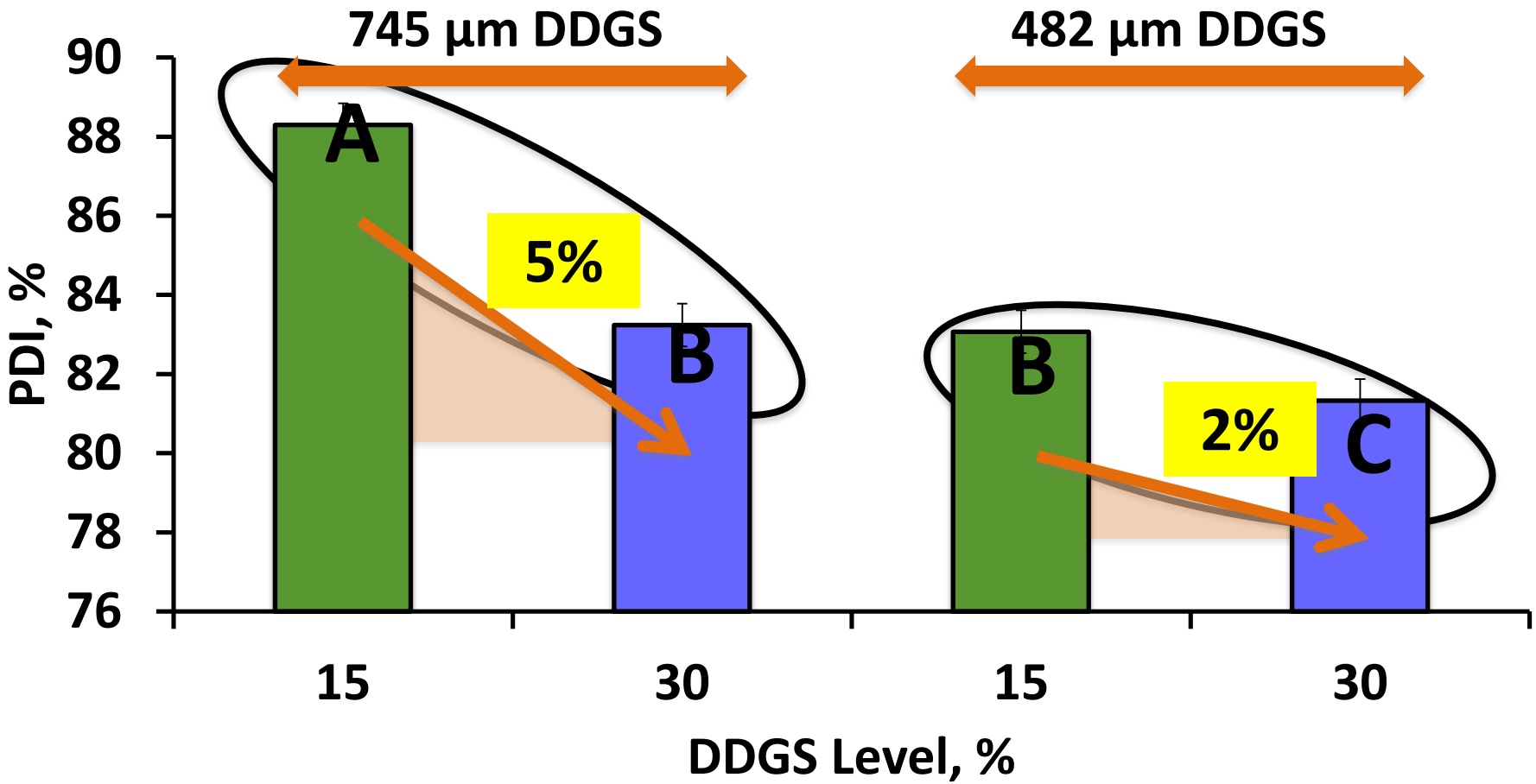
Impact of DDGS on PDI



Slide provided by Wilmer Pacheo

$^{A, B}$ $P < 0.01$

DDGS – Pellet Quality



Slide provided by Wilmer Pacheo

^{A,B,C} $P < 0.01$

Bulk Truck Loading Systems

Shuttle Conveyor

Weigh Lorry

Take Home Message

- Feed manufacturers manage a wide variety of ingredients and small changes the inclusion amount, in-bound quality, and processing environment can significantly change mill operations and efficiency.
- Educate your buyers about the ethanol manufacturing process.
- Consistency of raw ingredients is the key to the efficient operation of a feed mill.